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## Systematic Studies on the Tribe Meteorini (Hymenoptera, Braconidae) from Japan

### IV. The Groups of *Meteorus albizonalis* and *M. micropterus*

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**Abstract** The *albizonalis* and *micropterus* groups of the genus *Meteorus* HALIDAY are defined. Three Japanese species belonging to the *albizonalis* group are described as new species. Two species of the *micropterus* group are dealt with, one of them being new to Japan. Keys to the Japanese species of these groups are given.

#### The Group of *Meteorus albizonalis*

Length of body 3.0–5.5, of fore wing 2.5–5.0 mm.

**Head.** Width of head 1.5–1.7 times its length; length of eye in ♀ 1.6–3.0 times length of temple in dorsal aspect; eyes slightly or moderately convergent (Figs. 1–3); width of face in ♀ 1.0–1.7 times its height; OOL/OD=1.5–3.8; occipital carina complete; frons without a blunt tubercle in front of anterior ocellus; face not strongly convex (Fig. 4); clypeus rather strongly convex; mandible stout, twisted but not strongly so, more or less concave medially (Fig. 18); 4th antennal segment in ♀ 3.0–4.2 times as long as wide; subapical segments of antenna in ♀ without a ventral field of densely placed, erect basiconic pegs.

**Mesosoma.** Propodeum reticulate-rugose, with a median longitudinal carina, and with anterior and posterior transverse carinae.

**Wings.** Fore wing: Pterostigma not broad, vein r originating beyond the middle of it (Figs. 7–8); length of basal segment of posterior margin of pterostigma 1.7–2.0 times its width and 1.4–1.7 times length of apical segment of posterior margin; SR1 straight or weakly curved anteriad at the apex (Fig. 7);  $3-SR/r=0.6-1.5$ ;  $3-SR/r-m=0.4-0.7$  (Figs. 7, 9, 10); m-cu antefurcal to 2-SR. Wing membrane slightly infuscated.

**Legs.** Tarsal claws simple, without a submedial lobe (Fig. 13). Hind leg: Femur 4.8–6.0 times as long as wide.

**Metasoma.** First tergite slender at base, with small dorsopes, the striations not curved inwards (Fig. 20); ventral borders of 1st tergite widely separated; 2nd tergite smooth; ovipositor curved ventrad (Figs. 14–16); length of ovipositor sheath 0.5–1.7 times length of vein C+SC+R of fore wing; 2nd valvula wedge-shaped apically or almost simple (Fig. 17).

**Remarks.** This species-group is distinguished by the following combination

of character-states: Ovipositor distinctly curved ventrad (Figs. 14–16); vein 3-SR of fore wing very short ( $3\text{-SR}/r=0.6\text{--}1.5$  and  $3\text{-SR}/r\text{-m}=0.4\text{--}0.7$ ) (Figs. 7, 9–10); pterostigma not broad and vein  $r$  originating beyond the middle of it (Figs. 7–8); and striations of 1st tergite not curved inwards (Fig. 20). In addition to the three Japanese species, three European species (*M. abominator* (NEES, 1811) 1812), *M. punctifrons* THOMSON, 1895, and *M. consimilis* (NEES, 1834)) belong to this group. European species have been known as parasitoids of the Coleoptera (Tenebrionidae, Scolytidae) (HUDDLESTON, 1980).

#### Key to the Japanese Species of the Group of *Meteorus albizonalis*

1. Ovipositor long (Fig. 14), length of its sheath 1.4–1.7 times length of vein  $C+SC+R$  of fore wing; frons deeply concave; pronope large (Fig. 19).....*M. acutus* sp. nov.
- Ovipositor short (Figs. 15–16), length of its sheath 0.5–1.0 times length of vein  $C+SC+R$  of fore wing; frons flat or only slightly concave; pronope almost absent (*curvus*) or small (*albizonalis*) ..... 2.
2. Ocelli small,  $OOL/OD=2.8\text{--}3.8$ ; precoxal sulcus widely reticulate-rugose; ovipositor weakly curved (Fig. 15); scape slightly expanded apically (Fig. 5); antenna without a white band.....*M. curvus* sp. nov.
- Ocelli large,  $OOL/OD=1.5\text{--}2.0$ ; precoxal sulcus narrowly crenulate, with some rugae anteriorly; ovipositor strongly curved (Fig. 16); scape conspicuously expanded apically (Fig. 6); antenna of ♀ with a white band at apical 1/3.....*M. albizonalis* sp. nov.

#### *Meteorus acutus* sp. nov.

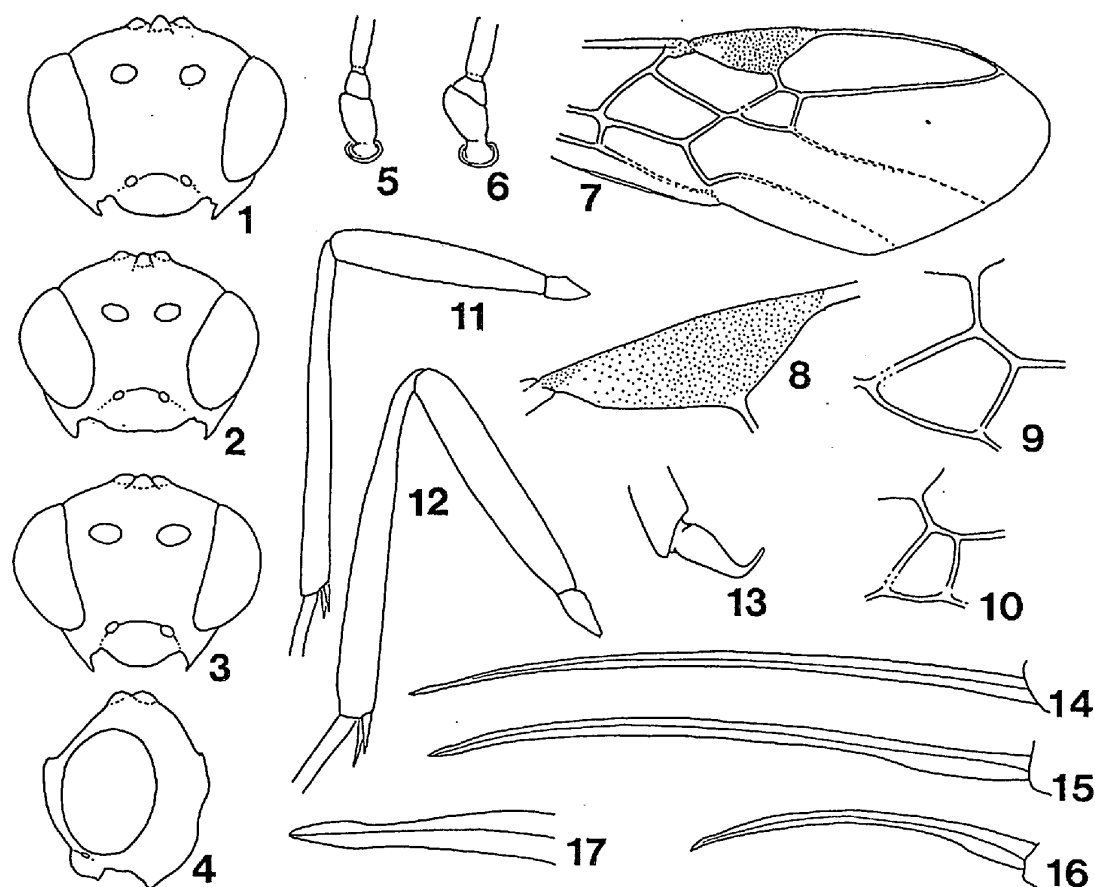
(Figs. 1, 4, 8–9, 13–14, 18–20)

♀. Length of body 4.5–5.5, of fore wing 4.0–5.0 mm.

Head. Length of eye 1.6–1.9 times length of temple in dorsal aspect; temple gradually narrowed posteriad; eyes slightly convergent (Fig. 1); width of face 1.2–1.4 times its height;  $OOL/OD=2.0\text{--}2.4$ ; vertex punctate; frons deeply concave, rugose anteriorly; face punctate or reticulate-punctate, with some rugae medially; clypeus punctate dorsally, longitudinally rugose ventrally; length of malar space 0.6–0.8 times basal width of mandible; mandible moderately twisted (Fig. 18), somewhat rugulose basally; antenna 39- or 40-segmented, scape slightly expanded apically, 4th and penultimate segments 3.2–4.2 and 1.4–1.7 times as long as wide, respectively.

Mesosoma. Pronope large and deep (Fig. 19); precoxal sulcus widely crenulate medially, widely reticulate-rugose anteriorly.

Wings. Fore wing: SR1 straight;  $3\text{-SR}/r=0.8\text{--}1.1$ ; cu-a interstitial or postfurcal;  $1\text{-CU1}/\text{cu-a}$  at most 0.5. Hind wing:  $\text{cu-a}/1M=1.3\text{--}2.3$ .



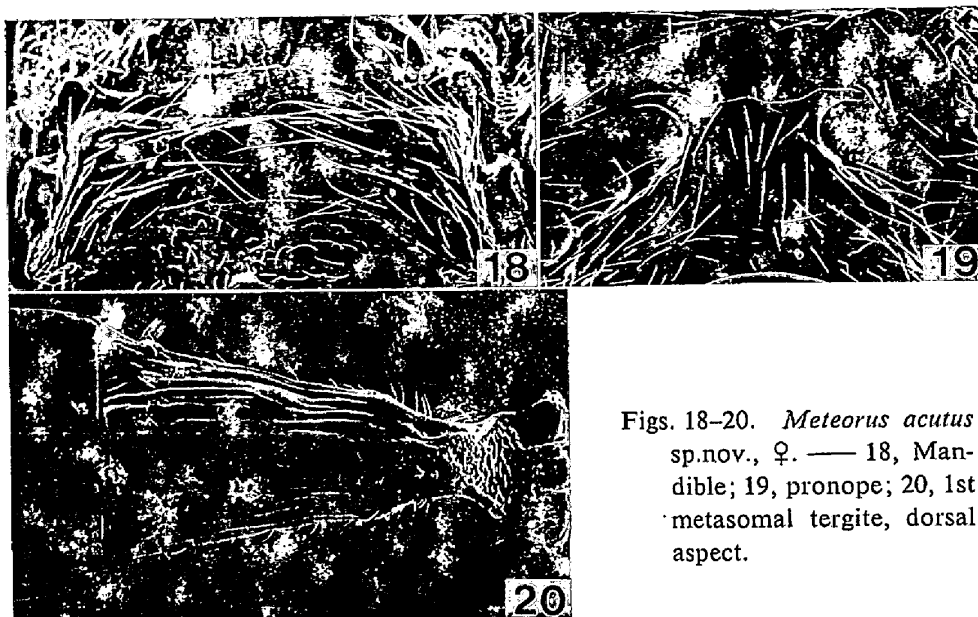
Figs. 1-17. — 1, 4, 8-9, 13-14, *Meteorus acutus* sp. nov., ♀; 2, 5, 7, 11, 15, *M. curvus* sp. nov., ♀; 3, 6, 10, 12, 16-17, *M. albizonalis* sp. nov., ♀. — 1-3, Head, frontal aspect; 4, head, lateral aspect; 5-6, scape and pedicel; 7, fore wing; 8, pterostigma; 9-10, 2nd submarginal cell of fore wing; 11-12, hind femur and tibia; 13, hind claw; 14-16, ovipositor; 17, apical portion of ovipositor.

**Legs.** Outer surface of hind coxa reticulate-punctate; hind femur 5.5-5.9 times as long as wide; hind tibia distinctly narrower than femur.

**Metasoma.** First tergite 2.2-2.6 times as long as wide apically, rugose at base, longitudinally striate behind dorsopes (Fig. 20); ovipositor rather weakly curved ventrad (Fig. 14); length of ovipositor sheath 1.4-1.7 times length of vein C+SC+R of fore wing.

**Colour.** Black; face, clypeus, antenna, tegula and 2nd tergite somewhat lighter; mandible mainly brownish yellow; palpi stramineous; fore and middle legs brown, coxae brownish yellow; hind leg dark brown; pterostigma brown, pale at base (Fig. 8).

♂. Similar to ♀ except for the following details: **Head.** — Length of eye 1.9-2.0 times length of temple; width of face 1.3-1.5 times its height; antenna 41-segmented, penultimate segment 2.1-2.2 times as long as wide. **Mesosoma.** — Precoxal sulcus less strongly sculptured. **Colour.** — Hind leg brown, coxa and femur



Figs. 18-20. *Meteorus acutus* sp.nov., ♀. — 18, Mandible; 19, pronope; 20, 1st metasomal tergite, dorsal aspect.

yellowish.

**Holotype:** ♀ (Type No. 2568, Kyushu Univ.), Shimashima-dani (1,000–1,300 m), Nagano Pref., 28. vii. 1980, K. MAETÔ leg. Deposited in the Entomological Laboratory, Faculty of Agriculture, Kyushu University, Fukuoka, Japan.

**Paratypes:** [Honshu]: Same locality as holotype (1 ♀, 28. vii. 1980, light trap, H. TAKEMOTO). [Kyushu]: Mt. Hakuchôzan, Kumamoto Pref. (2 ♀, 1 ♂, 9. vii. 1978, light trap, 3 ♀, 10. vii. 1978, K. MAETÔ; 1 ♂, 9. vii. 1978, K. ÔHARA; 1 ♀, 10. vii. 1978, T. SAIGUSA; 1 ♀, 19. vii. 1983, light trap, K. KONISHI).

**Distribution.** Japan (Honshu, Kyushu).

**Remarks.** This species is distinct in having the long ovipositor, the large pronope and the deeply concave frons. In general appearance (large and black body with a long ovipositor), it resembles the species of the *corax* group, but has the slender 1st tergite with small dorsopes, the female antenna without densely placed basiconic pegs, the short vein 3-SR and the curved ovipositor.

*Meteorus curvus* sp. nov.

(Figs. 2, 5, 7, 11, 15)

♀. Length of body 3.5–5.0, of fore wing 3.0–4.5 mm.

**Head.** Length of eye 2.0–2.2 times length of temple in dorsal aspect; temple gradually narrowed posteriad; eyes moderately convergent (Fig. 2); width of face 1.0–1.5 times its height; ocelli very small,  $OOL/OD=2.8-3.8$ ; vertex smooth; frons slightly concave behind antennal sockets, almost smooth or transversely strigose; face punctate-rugose; clypeus punctate; length of malar space 0.4–0.5 times basal width of mandible; mandible weakly twisted, almost smooth; antenna 24- to 26-

segmented, scape slightly expanded apically (Fig. 5), 4th and penultimate segments 3.4–4.2 and 1.2–1.5 times as long as wide, respectively.

**Mesosoma.** Pronope transverse, narrow, almost absent; precoxal sulcus widely reticulate-rugose.

**Wings.** Fore wing (Fig. 7): SR1 curved anteriad apically;  $3\text{-SR}/r=1.0\text{--}1.5$ ;  $cu\text{-}a$  postfurcal;  $1\text{-CU1}/cu\text{-}a=0.4\text{--}0.6$ . Hind wing:  $cu\text{-}a/1M=0.8\text{--}1.3$ .

**Legs.** Outer surface of hind coxa punctate but somewhat rugose dorsally; hind femur 4.7–5.0 times as long as wide; hind tibia distinctly narrower than femur (Fig. 11).

**Metasoma.** First tergite 1.9–2.1 times as long as wide apically, longitudinally striate behind dorsopes, usually with some rugae centrally; ovipositor moderately curved ventrad (Fig. 15); length of ovipositor sheath 0.9–1.0 times length of vein  $C+SC+R$  of fore wing.

**Colour.** Black to dark reddish-brown; face, clypeus, antenna basally and prothorax somewhat lighter; mandible mainly and tegula brownish yellow; palpi brown to dark brown; 2nd tergite and basal portion of 3rd tergite light reddish brown; legs brown to light reddish brown; pterostigma brown, pale at base and apex (Fig. 7).

♂. Similar to ♀ except for the following details: Length of eye 1.2–1.5 times length of temple; temple rather roundly narrowed posteriad; width of face 1.8–2.1 times its height; length of malar space 0.5–0.7 times basal width of mandible; antenna 29- or 30-segmented, penultimate segment 1.9–2.4 times as long as wide.

**Holotype:** ♀ (Type No. 2569, Kyushu Univ.), Horoka (700–1,000 m), Kamishihoro-machi, Hokkaido, 2. vii. 1980, K. MAETÔ leg. Deposited in the Entomological Laboratory, Faculty of Agriculture, Kyushu University, Fukuoka, Japan.

**Paratypes:** [Hokkaido]: Yamabe, Furano (1 ♀, 5. vii. 1977, K. YAMAGISHI). Nukabira (1 ♀, 1 ♂, 30. vi. 1980, K. MAETÔ). Kyushu Univ. Exp. Forest, Ashoro (1 ♀, 1 ♂, 24–26. vi. 1980, H. TAKEMOTO). Nakayama-tôge, Kimobetsu-machi (1 ♂, 15. vii. 1980, K. MAETÔ). Toyotomi, Sarobetsu (1 ♂, 2. viii. 1961, C. WATANABE). [Honshu]: Mt. Tateyama, Toyama Pref. (1 ♂, 5–7. viii. 1960, T. HIDAHA).

**Distribution.** Japan (Hokkaido, Honshu).

**Remarks.** This species is very close to *M. abdominalis* (NEES) from Europe in having very small ocelli, the widely rugose precoxal sulcus and the apically curved vein SR1 of the fore wing, but is distinguished from the latter by the shorter malar space, the narrower face and the less strongly twisted mandible.

### *Meteorus albizonalis* sp. nov.

(Figs. 3, 6, 10, 12, 16–17)

♀. Length of body 3.5–4.0, of fore wing 3.0–3.5 mm.

**Head.** Length of eye 2.4–3.0 times length of temple in dorsal aspect; temple

directly narrowed posteriad; eyes slightly convergent (Fig. 3); width of face 1.3–1.7 times its height; ocelli large,  $OOL/OD=1.5-2.0$ ; vertex weakly punctulate; frons almost flat, smooth; face punctate, somewhat rugose medially; clypeus punctate; length of malar space 0.7–0.9 times basal width of mandible; mandible rather strongly twisted; antenna 34- to 36-segmented, scape conspicuously expanded apically (Fig. 6), 4th and penultimate segments 3.0–3.7 and 0.8–1.2 times as long as wide, respectively.

**Mesosoma.** Pronope small but distinct; precoxal sulcus narrowly crenulate, with some rugae anteriorly.

**Wings.** Fore wing:  $SR1$  straight;  $3-SR/r=0.6-1.2$ ;  $cu-a$  postfurcal;  $1-CU1/cu-a=0.7-1.2$ . Hind wing:  $cu-a/1M=0.9-1.3$ .

**Legs.** Outer surface of hind coxa punctate-rugose ventrally, reticulate-rugose dorsally; hind femur 5.2–6.0 times as long as wide; hind tibia swollen, only a little narrower than femur (Fig. 12).

**Metasoma.** First tergite 1.8–2.1 times as long as wide apically, longitudinally striate, sometimes with some rugae centrally; ovipositor strongly curved ventrad (Fig. 16); length of ovipositor sheath 0.5–0.7 times length of vein  $C+SC+R$  of fore wing.

**Colour.** Black to dark reddish brown; face, prothorax and 2nd tergite more reddish occasionally; clypeus, mandible mainly, tegula, fore and middle legs brownish yellow; antenna dark brown, yellowish basally, with a white band at apical 1/3; palpi stramineous; hind leg brownish yellow, tibia darker; pterostigma brown, pale at base and apex.

♂. Unknown.

**Holotype:** ♀ (Type No. 2570, Kyushu Univ.), Mt. Apoi (200 m), Samani, Hokkaido, Japan, 7. ix. 1977, K. YAMAGISHI leg. Deposited in the Entomological Laboratory, Faculty of Agriculture, Kyushu University, Fukuoka, Japan.

**Paratypes:** [Hokkaido]: Same data as holotype (17 ♀). Kitamoshiri near Nayoro (9 ♀, 12. ix. 1977, K. YAMAGISHI). [Honshu]: Mt. Karasugasen, Tottori Pref. (2 ♀, 21. viii. 1980, M. KOTANI). Mt. Shiwakisan, Hiroshima Pref. (1 ♀, 10. viii. 1978, T. GOYÔ).

**Distribution.** Japan (Hokkaido, Honshu).

**Remarks.** This species is clearly related to *M. consimilis* (NEES) from Europe in having the short and strongly curved ovipositor, the large ocelli, the swollen hind tibia of the female and the expanded scape, but is distinct from the latter in having the short malar space and the female antenna with a white band at apical 1/3.

### The Group of *Meteorus micropterus*

Length of body 3.5–6.0, of fore wing 3.0–5.0 mm.

**Head.** Width of head 1.4–1.6 times its length; length of eye in ♀ 1.0–1.8 times length of temple in dorsal aspect; eyes not convergent (Fig. 21); width of

face in ♀ 1.3–2.0 times its height;  $OOL/OD=1.8-4.0$ ; occipital carina interrupted medio-dorsally; frons weakly concave behind antennal sockets, without a blunt tubercle in front of anterior ocellus; face strongly convex, forming a “shelf” on which antennae are mounted (Figs. 22–23); mandible stout, slightly or moderately twisted; 4th antennal segment in ♀ 1.7–2.2 times as long as wide; subapical segments of antenna in ♀ without a ventral field of densely placed, erect basiconic pegs.

**Mesosoma.** Propodeum reticulate-rugose, without a median longitudinal carina, usually with indistinct anterior and posterior transverse carinae.

**Wings.** Fore wing: Length of basal segment of posterior margin of pterostigma 1.6–2.2 (1.9–2.2 in *micropterus* and 1.6–1.8 in *salicorniae*) times its width and 1.1–1.6 (1.3–1.6 in *micropterus* and 1.1–1.3 in *salicorniae*) times length of apical segment of posterior margin (Fig. 24); SR1 straight;  $3-SR/r=1.5-4.0$ ;  $3-SR/r-m=0.7-1.1$ ; m-cu antefurcal or interstitial to 2-SR; cu-a interstitial or postfurcal.

**Legs.** Tarsal claws simple, without a submedial lobe (Fig. 28). Hind femur 3.6–4.5 times as long as wide (Figs. 26–27); tibia distinctly narrower than femur.

**Metasoma.** First tergite slender at base, with or without dorsopes; 2nd tergite smooth; ovipositor straight (Fig. 30); length of ovipositor sheath 1.0–1.5 times length of C+SC+R of fore wing; 2nd valvula wedge-shaped apically.

**Remarks.** This species-group is characterized by the following peculiar character-states: Face strongly convex (Figs. 22–23); occipital carina interrupted medio-dorsally; 4th antennal segment of female stout (1.7–2.2 times as long as wide); hind femur stout (3.6–4.5 times as long as wide) (Figs. 26–27); and propodeum without a median longitudinal carina.

#### Key to the Japanese Species of the Group of *Meteorus micropterus*

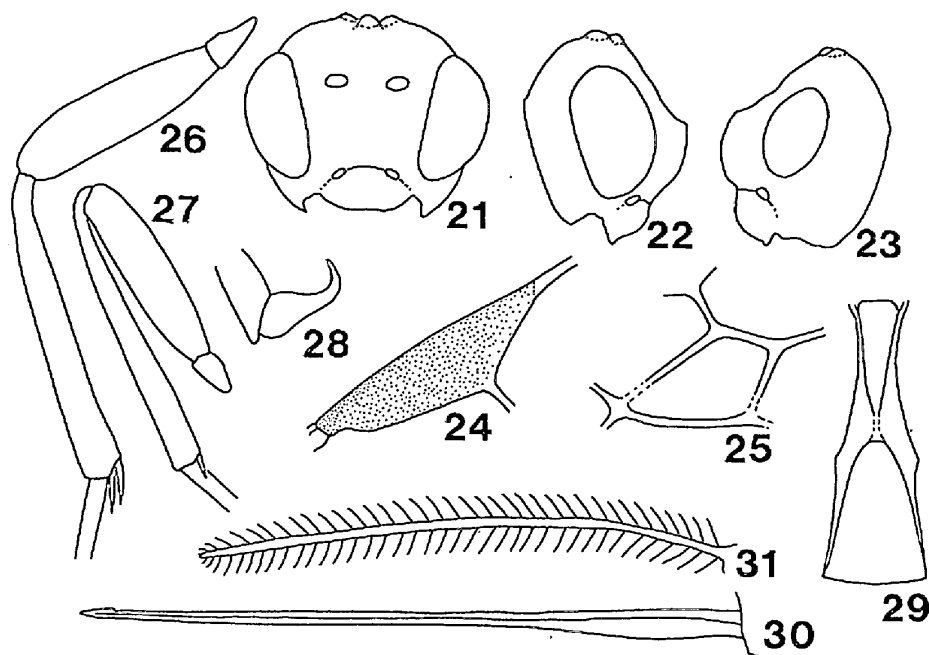
1. First tergite without dorsopes, its ventral borders jointed near the middle (Fig. 29); ovipositor sheath with inclined, short hairs; eye large (Fig. 22); mandible moderately twisted, with a ventral carina medially; female antenna at most 28-segmented; length of ovipositor sheath 1.0–1.1 times length of vein C+SC+R of fore wing. . . . . *M. micropterus* (HALIDAY).
- First tergite with dorsopes, its ventral margins widely separated; ovipositor sheath with erect, very long hairs (Fig. 31); eye small (Fig. 23); female antenna at least 34-segmented; length of ovipositor sheath 1.2–1.5 times length of vein C+SC+R of fore wing. . . . . *M. salicorniae* SCHMIEDEKNECHT.

#### *Meteorus micropterus* (HALIDAY)

(Figs. 21, 22, 24–26, 28–30)

*Perilitus* (*Meteorus*) *micropterus* HALIDAY, 1835, Ent. Mag., 3: 27 (Ireland).

*Meteorus micropterus*: HUDDLESTON, 1980, Bull. Br. Mus. nat. Hist., (Ent.), 41: 39 (redescription).



Figs. 21-31. — 21, 22, 24-26, 28-30, *Meteorus micropterus* (HALIDAY), ♀; 23, 27, 31, *M. salicorniae* SCHMIEDEKNECHT, ♀. — 21, Head, frontal aspect; 22-23, head, lateral aspect; 24, pterostigma; 25, 2nd submarginal cell of fore wing; 26-27, hind femur and tibia; 28, hind claw; 29, 1st metasomal tergite, ventral aspect; 30, ovipositor; 31, ovipositor sheath.

This species is new to Japan. The Japanese specimens agree with an authentic European specimen (1 ♂) and the redescription given by HUDDLESTON (1980), but differ in having the following character-states: OOL/OD=1.8-2.3; length of malar space 0.4-0.6 times basal width of mandible; and antenna 27- or 28-segmented (♀), or 29- to 31-segmented (♂).

*Specimens examined.* [Shikoku]: Mt. Omogo, Ehime Pref. (1 ♀, 22. vii. 1980, M. KOTANI). Oonogahara, Ehime Pref. (1 ♂, 7. vii. 1979, M. KOTANI). [Kyushu]: Mt. Hikosan, Fukuoka Pref. (1 ♀, 25. vi. 1966, A. TAKETANI). Mt. Aso, Kumamoto Pref. (1 ♂, 15. vii. 1962, M. SHIGA). Mt. Sobosan, Ōita Pref. (2 ♂, 13. vii. 1979, T. GOTÔ). Mt. Takachihonome, Miyazaki Pref. (2 ♂, 6. vii. 1979, N. KÔDA; 1 ♂, 6. vii. 1979, T. GOTÔ). [Yakushima Is.]: (1 ♀, 2. vi. 1965, H. TAKADA).

*Distribution.* Japan (Shikoku, Kyushu, Yakushima Is.); Europe.

*Hosts.* *Hepialus humuli* (L.) and *H. fusconebulosa* (DE GEER) (Lepidoptera: Hepialidae) in Europe (HUDDLESTON, 1980).

### *Meteorus salicorniae* SCHMIEDEKNECHT

(Figs. 23, 27, 31)

*Meteorus salicorniae* SCHMIEDEKNECHT, 1897, Illte. Wschr. Ent., 2: 189 (Germany); HUDDLESTON, 1980, Bull. Br. Mus. nat. Hist., (Ent.), 41: 48 (redescription).



*Meteorus ocellatus* WATANABE, 1951, Mushi, **22**: 45 (Japan: Kyushu). (Synonymized by HUDDLESTON, 1980.)

The Japanese specimens agree with the redescription given by HUDDLESTON (1980), except for the following details: Length of malar space 0.9–1.0 times basal width of mandible; and antenna 34- to 36-segmented (♀) or 37- to 39-segmented (♂).

*Specimens examined.* [Honshu]: Hachimantai, Akita Pref. (1 ♂, 29. vii. 1961, M. SHIGA). Mt. Gassan, Yamagata Pref. (1 ♀, 18. viii. 1980, T. GOTÔ). [Kyushu]: Mt. Hikosan, Fukuoka Pref. (3 ♀, 17. v. 1948, K. YASUMATSU, holotype and paratypes of *Meteorus ocellatus* WATANABE, 1951; 1 ♀, 13. x. 1958, K. YASUMATSU). Mt. Sobosan, Ōita Pref. (1 ♂, 20–24. vii. 1980, K. KONISHI). [Yakushima Is.]: Mt. Aikodake (1 ♂, 11. v. 1983, K. KONISHI).

*Distribution.* Japan (Honshu, Kyushu, Yakushima Is.); Europe.

### Reference

HUDDLESTON, T., 1980. A revision of the western Palaearctic species of the genus *Meteorus* (Hymenoptera: Braconidae). *Bull. Br. Mus. nat. Hist., (Ent.)*, **41**: 1–58.